

CLAIMS

1. Hydraulic tilting device for tilting the cab of a vehicle between a driving position, in which the vehicle can be driven normally, and a tilted position, in which, for example, maintenance can be carried out on a vehicle engine positioned beneath the cab, comprising:
- a tilting cylinder having a first and a second connection,
 - a reservoir for hydraulic fluid,
 - 10 - a pump having one single pumping direction, which pump has a suction port, which is in communication with the reservoir, and a delivery port for delivering pressurized hydraulic fluid,
 - a valve with an inlet passage which is connected to the delivery port of the pump and a first and a second outlet passage, which valve has an actuatable shut-off member, so that in a first position thereof the delivery port is connected, via the first outlet passage, to the first connection of the tilting cylinder and in the second position thereof the delivery port is connected, via the second outlet passage, to the second connection of the tilting cylinder,
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- characterized in that** the valve also comprises hydraulic actuating means for actuating the shut-off member, which hydraulic actuating means are designed in such a manner that, as a result of the pump supplying hydraulic fluid to the inlet passage, the shut-off member is moved into the first position or into the second position, and as a result of this supply then being stopped or reduced and then being restored again, the shut-off member is moved into the second position or first position, respectively.
2. Hydraulic tilting device according to claim 1, in which the hydraulic actuating means comprise a body which can be displaced between an at-rest position and an actuated position and is accommodated in the housing, preferably a sliding body which can be slid inside an associated bore and moves from the said at-rest position to the actuated position as a result of hydraulic fluid being supplied to the inlet passage, as well as
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an associated restoring assembly for restoring the body.

3. Hydraulic tilting device according to claim 2, in which the body is provided with a through-passage, in such a manner that flow of hydraulic fluid from the pump through the inlet passage and through the through-passage to an outlet passage of the valve moves the body towards the actuated position, counter to the action of the restoring assembly.
4. Hydraulic tilting device according to claim 2 or 3, in which a switching element is arranged between the said body and the shut-off member, in such a manner that during a first displacement of the body towards the actuated position the shut-off member is moved to the first or second position, and as a result of this supply then being stopped or reduced and then restored again, the shut-off member is moved in the second or first position, respectively.
5. Hydraulic tilting device according to one or more of the preceding claims, in which the valve comprises:
- a housing,
 - a bore in the housing, which bore has an imaginary axial axis and at each of its axial ends is delimited by a base of the housing,
 - a sliding body which can slide in a reciprocating manner in the axial direction in the bore and defines an inlet chamber and an outlet chamber in the bore, which sliding body can be slid between an at-rest position and an actuated position,
 - an inlet passage in the housing, which at an inlet opening is connected to the inlet chamber,
 - a first outlet passage formed in the housing and a second outlet passage formed in the housing, which outlet passages are each connected to the outlet chamber at an associated first and second outlet opening, respectively,
 - a through-passage, which extends between the inlet chamber and the outlet chamber, being provided in the sliding body,
 - an actuatable shut-off member, which in a first position thereof closes off the first outlet opening and opens up

- the second outlet opening and in a second position thereof opens up the first outlet opening and closes off the second outlet opening, being accommodated in the outlet chamber,
- a switching assembly for actuating the shut-off member also being accommodated in the outlet chamber,
 - the switching assembly on one side acting on the sliding body and on the other side acting on the shut-off member,
 - the through-passage in the sliding body being such that a flow of hydraulic fluid from the inlet chamber to the outlet chamber slides the sliding body towards the actuated position, and the sliding body returning to the at-rest position when this flow ceases,
 - the switching assembly, in the event of the sliding body sliding from the at-rest position towards the actuated position as a result of hydraulic fluid flowing through the through-passage in the sliding body, holding the first shut-off member in the first position, so that hydraulic fluid flows from the inlet passage towards the second outlet passage,
 - and the switching assembly, after this hydraulic flow has ceased and then been restored, so that the sliding body slides back towards the actuated position, moving the first shut-off member into the second position thereof, so that hydraulic fluid flows from the inlet passage to the first outlet passage.

6. Hydraulic tilting device according to claim 5, in which the switching assembly comprises a switching element, which is arranged in the outlet chamber between the sliding body and the shut-off member, and in which the switching assembly also comprises a spring element, which can be elastically compressed under the influence of the sliding body sliding from the at-rest position towards the actuated position, the switching assembly restoring the sliding body to the at-rest position when the hydraulic flow from the inlet chamber to the outlet chamber ceases,

in which the switching element can adopt a first limit diagonal position and a second limit diagonal position with respect to the axial axis of the valve,

in which the switching element, when the sliding body is sliding from the at-rest position towards the actuated position as a result of hydraulic fluid flowing through the through-passage in the sliding body, adopts the first limit diagonal position and thereby holds the shut-off member in the first position, so that hydraulic fluid flows from the inlet passage towards the second outlet passage,

and in which the switching element, when the sliding body is sliding towards the at-rest position under influence of the said switching element, when the said hydraulic fluid flowing through the through-passage in the sliding body ceases, tilts in the direction of the second limit diagonal position,

and in which the switching element, when the sliding body is subsequently sliding towards the actuated position as a result of the flow of hydraulic fluid through the through-passage into the sliding body being restored, adopts the second limit diagonal position and thereby moves the shut-off member into its second position, so that hydraulic fluid flows from the inlet passage towards the first outlet passage.

7. Hydraulic tilting device according to claim 5 or 6, in which the switching assembly comprises a telescopic switching element having a first body and a second body, which bodies are guided telescopically with respect to one another, and in which the spring element of the switching assembly is arranged in such a manner that the spring element forces the first and second bodies apart, with the first body acting on the sliding body and the second body acting on the shut-off member.

8. Hydraulic tilting device according to claim 5 or 6, in which the switching assembly comprises a rigid switching element having a first and a second end, which respectively act on the sliding body and on the shut-off member, and in which the spring element is arranged between the housing and the shut-off member.

9. Hydraulic tilting device according to one or more of the preceding claims 5-8, in which the switching element can come to act, at diametrically opposite positions, on the housing or the sliding body, in each case so as to form a tilting point for the

switching element, in such a manner that when the sliding body is being restored to the at-rest position, the switching element, which is located in the first or second limit diagonal position, executes a tilting motion with respect to the
5 corresponding tilting point, in the direction of the second or first limit diagonal position, respectively.

10. Hydraulic tilting device according to claim 9, in which the switching element, at diametrically opposite positions, can come
10 into engagement with the housing or the sliding body, so as to form a hook connection between the two components, in such a manner that when the sliding body is being restored to the at-rest position, the switching element, which is in the first or second limit diagonal position, tilts in the direction of the
15 other limit diagonal position and reaches an intermediate position.

11. Hydraulic tilting device according to one or more of the preceding claims 5-10, in which a second shut-off member is
20 provided for shutting off the through-passage in the sliding body in the at-rest position of the sliding body.

12. Hydraulic tilting device according to one or more of the preceding claims 5-11, in which the second shut-off member can
25 be actuated by the switching element, in such a manner that in the first and second limit diagonal positions the second shut-off member opens up the through-passage and in any intermediate position of the switching element shuts off the through-passage, and in which the second shut-off member is
30 preferably integral with the switching element, for example the second shut-off member is a single ball.

13. Hydraulic tilting device according to one or more of the preceding claims 5-12, in which the first shut-off member is
35 integral with the switching element and the outlet openings of the first and second outlet passages are arranged in the base of the housing, in such a manner that in the first limit diagonal position of the switching element the first shut-off member bears in a sealing manner against the outlet opening of the

first outlet passage and in the second limit diagonal position bears against the outlet opening of the second outlet passage, and in which the first shut-off member is preferably a single ball.

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14. Hydraulic tilting device according to one or more of the preceding claims 5-13, in which a first and a second bypass passages, an opening of which is connected to the outlet chamber, forming a connection between the first and second outlet passages other than via the outlet openings thereof, are provided in the housing, and in which the sliding body, in the actuated position, shuts off the openings of the bypass passages and, in a position which deviates from the actuated position, opens up the openings of the bypass passages.

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15. Hydraulic tilting device according to one or more of the preceding claims 5-14, in which the first shut-off member is separate from the switching element, which first shut-off member can be tilted with respect to the base of the housing about a tilting point located between the openings of the outlet passages in the base, the first shut-off member being provided, on either side of the said tilting point, with a shut-off surface for the corresponding opening, in such a manner that in the first tilted position the first outlet opening is shut off and in the second tilted position the second outlet opening is shut off, and in which preferably the first shut-off member is provided with a first and a second engagement formation for the switching element, which engagement formations lie at a distance from one another on either side of the tilting point of the first shut-off member, in such a manner that in the first limit diagonal position the switching element engages on the first engagement formation and in the second limit diagonal position the switching element engages on the second engagement formation.

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16. Hydraulic tilting device according to claim 15, in which the first shut-off member comprises a first and a second ball, which are accommodated in a common carrier, which carrier, between the balls, is tiltably supported on the base of the

housing, and in which preferably the first and second balls each on one side form the shut-off surface for an outlet opening and on the other side also form the engagement formation for the switching element.

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17. Hydraulic tilting device according to one or more of the preceding claims 5-16, in which the outlet openings are formed in the circumferential wall of the bore in the housing at diametrically opposite locations, and in which the first
10 shut-off member is an annular body which fits into the bore with radial play, is situated at the location of the outlet openings in the bore and in a first position thereof covers the first outlet opening in a sealing manner and in the second position thereof covers the second outlet opening in a sealing manner,
15 the switching element being designed to act on the annular body.

18. Hydraulic tilting device according to claim 17, in which the switching element is a telescopic switching element which is slidably supported against the base of the housing in the
20 vicinity of the annular body.

19. Hydraulic tilting device according to claim 17, in which the switching element is a rigid switching element which is supported against the annular body, preferably against a base
25 wall provided in the annular body, and in which the spring element is positioned between the housing and the annular body.

20. Hydraulic tilting device according to claim 18 or 19, in which one or more through-passages for hydraulic fluid to pass
30 through are provided in the annular body.

21. Hydraulic tilting device according to one or more of the preceding claims, in which the outlet openings of the valve are each provided with a non-return valve which closes in the
35 direction of the outlet chamber.

22. Hydraulic tilting device according to one or more of the preceding claims, in which a bypass connection with an elastic shut-off member is provided between the outlet passages, which

shut-off member, in the event of excess pressure in one of the outlet passages with respect to the other outlet passage, opens the bypass connection, and in which preferably the switching element actuates the elastic shut-off member, in such a manner that in each limit diagonal position of the switching element the bypass connection is shut off by the shut-off member.

23. Hydraulic tilting device according to claim 22, in which the elastic shut-off member is a disc body which bears against the base of the housing, in which disc body the non-return valves are accommodated, which disc body is fixed to the housing at its circumferential edge and in the region between the openings of the outlet passages in the base of the housing can bend elastically away from this base under the influence of an excess pressure in an outlet passage at least in the at-rest position of the sliding body of the valve.

24. Hydraulic tilting device according to one or more of the preceding claims 2-23, in which the sliding body is an annular body with a transverse wall provided with a central through-passage.

25. Hydraulic tilting device according to one or more of the preceding claims 3-24, in which the switching element is provided with an outwardly projecting circumferential edge with an undercut, and in which the housing or sliding body is provided, at diametrically opposite positions, with tilting-point members with a corresponding undercut, in such a manner that the switching element, as a result of the circumferential edge engaging with a tilting-point member, forms a tilting point and a connection to the housing or the sliding body, so that when the sliding body is sliding from the actuated position towards the at-rest position the switching element tilts about the said corresponding tilting point towards an intermediate position and is held in this intermediate position, with the circumferential edge coming clear of the tilting-point member and the switching element adopting its other limit diagonal position when the sliding body subsequently slides towards the actuated position.

26. Hydraulic tilting device according to claim 25, in which the tilting-point member is provided on the sliding body and the circumferential edge is provided on the second body of the
5 switching element.

27. Hydraulic tilting device according to claim 26, in which the tilting-point member is provided on the housing and the circumferential edge is provided on the first body of the
10 switching element.

28. Hydraulic tilting device according to claim 26, in which the tilting-point members are formed by creating an internal edge in the sliding body and then forming two slot recesses at
15 the level of this edge, in such a manner that two diametrically opposite tilting-point members remain.

29. Valve as described in claim 21, in which the non-return valves are accommodated in an elastically deformable body which,
20 at least in a connecting region between the outlet passages, can bear in a sealing manner against the base of the housing.